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SPRING MIGRANT AND BREEDING BIRD CENSUS STUDIES IN
 FIVE HABITAT TYPES IN SAND CANYON, MOJAVE DESERT,
 CALIFORNIA

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Desert Riparian Willows - Breeding Bird Survey

DESERT RIPARIAN WILLOWS. -- Location: California; Inyo and Kern Counties, Sand Canyon, in southern most extension of the Sierra Nevadas, 12 miles north on highway 14 from intersection of state highways 178 and 14, then 3.5 miles west on Brown Road; from center of Sec. 7, T 25 S, R 38 E, the plot extends up the canyon following the main stream approximately 2.3 km, Little Lake Quadrangle 1954, USGS. Continuity: New. Size: 2.3 ha = 5.68 acres. Description of Area: Canyon bottom with constant running stream. Area studied was approximately 2 to 3 m on each side of the stream which was uniformly covered with willows. Adjacent to the willows were open areas of varying vegetation depending on location in the canyon. A dirt road followed the stream at varying distances all along the willow plot. Three intermittent streams and many gullies fed the stream after rains.

Vegetation: See vegetation study of area. Topography: The stream cuts thru boulders and base rock at a fairly constant slope up the canyon from an altitude of about 3200 to 3760 ft. (976 - 1146 m) on the approximate 2.3 km of the length of the study area. The canyon runs from west to east starting in the Sierra Nevada and opening onto the Mojave Desert. Weather: Temperatures ranged from 45° to 94° F. Light rain fell on April 30 and May 1. Heavy rain fell on May 8 and 9. Some precipitation occurred on several other days in May.

Coverage: April 16, 17, 23; May 12, 19, 20, 25 and 26. Total, 8 trips between 0430 and 0830 (Pacific Standard Time). Total man-hours: 32. Count: (breeding birds) Mourning Dove, 30 (1304, 528); Costa's Hummingbird, 12 (522, 211); Ash-throated Flycatcher, 4 (174, 70); Western Wood Pewee, 2 (87, 35); Scrub Jay, 6 (261, 106); Bewick's Wren, 16 (696, 282); Warbling Vireo, 4 (174, 70); Wilson's Warbler, 16 (696, 282); Black-headed Grosbeak, 8 (348, 141); Lazuli Bunting, 18 (783, 317); House Finch, 14 (609, 246); Lesser Goldfinch, 6 (261, 106); Brown Towhee, 12 (522, 211). Averaged Total: 148 birds (6437/km², 2605/100 acres). Visitors: Turkey Vulture, 1; California Quail, 8; Mourning Dove, 90+; Belted Kingfisher, 1; Ladder-backed Woodpecker, 2; Western Wood Pewee, 2; Western Flycatcher, 4; Empidonax sp., 41; Robin, 1; Hermit Thrush, 26; Swainson's Thrush, 1; Ruby-crowned Kinglet, 54; Phainopepla, 3; Solitary Vireo, 4; Orange-crowned Warbler, 1; Nashville Warbler, 3; Yellow Warbler, 8; Yellow-rumped Warbler, 27; Townsend's Warbler, 9; MacGillivroy's Warbler, 5; Yellow-breasted Chat, 2; Wilson's Warbler, 20; American Redstart, 3 (rare in California); Red-winged Blackbird, 1; Brown-headed Cowbird, 6; Western Tanager, 10; Black-headed Grosbeak, 11; Indigo Bunting, 1 (rare in California); Lazuli Bunting, 6; House Finch, 14; Lesser Goldfinch, 7; Lawrence's Goldfinch, 2; Green-tailed Towhee, 1; Dark-eyed Junco, 7; Chipping Sparrow, 6;

White-crowned Sparrow, 20; Lincoln's Sparrow, 9.

Remarks: High density figures are to some extent an artifact of the sampling technique. While the area of willow habitat is only 2.3 hectares, many birds nesting in the willows use adjacent habitats extensively. Thus the actual area of all habitats used by the birds breeding in the willows is probably 10 or 20 times greater than the area of pure willows. Estimates of numbers of House Finches and Mourning Doves may be inaccurate due to the difficulties of telling breeding birds from those simply passing through. The Hermit Thrush may breed on the census area, though no positive evidence was found. Thrushes appeared to be regularly spaced along the stream and were repeatedly found in the same locations.

The Brown-headed Cowbird probably reproduces in the area, but no actual cases of parasitism were recorded.

Several species that might have been expected to breed here apparently did not. Noteworthy among these were Bell's Vireo, Yellowthroat and Yellow-breasted Chat.

Joshua Tree Woodland - Breeding Bird Survey

JOSHUA TREE WOODLAND. -- Location: California; Inyo and Kern Counties, Sand Canyon, in southern most extension of the Sierra Nevadas, 12 miles north on highway 14 from intersection of state highways 178 and 14, then about 5 miles west on Brown Road; SE corner of the plot is about 50 m north of road (on the map, the plot lies north of the y formed by the intersection of the main stream bed and the intermittent stream from the South Fork); would be SE $\frac{1}{4}$ of Sec. 1, T 25 S, R 37 E, if defined on map, Little Lake Quadrangle, 1954 USGS.

Continuity: New. Size: 11.9 ha = 29.8 acres. Description of Area: Plot sparsely covered with small shrubs, .5 to 1 m high. Joshua Trees, *Yucca brevifolia*, scattered over plot. Concentrations of Joshua Trees occur near center and west boundary of plot. Plot bounded on east and west by similar scrub-Joshua Tree associations and north and south by rock outcroppings and a dirt road respectively. Vegetation: See vegetation study of area. Topography: Plot is on south facing slope, cut by two shallow ravines. Substrate of decomposing granitic rock overlain with a thin layer of sand. Numerous boulders lie along southern boundary of plot. Weather: Temperatures ranged from 45° to 94° F. Light rain fell on April 30 and May 1. Heavy rain fell on May 8 and 9. Some precipitation occurred on several other days in May. Coverage: May 2, 5, 11, 14, 21,

22, 24, 28. Total, 8 trips between 0430 and 0900 (Pacific Standard Time). Total man-hours 16. Count: (breeding birds) Costa's Hummingbird, 4 (34, 13); Ladder-backed Woodpecker, 2 (17, 7); Ash-throated Flycatcher, 2 (17, 7); Cactus Wren, 2 (17, 7); Rock Wren, 4 (34, 13); Loggerhead Shrike, 2 (17, 7); Scott's Oriole, 2 (17, 7); House Finch, 12 (101, 40); Black-throated Sparrow, 14 (118, 47). Averaged Total: 44 birds ($372/\text{km}^2$, 148/100 acres). Visitors: Prairie Falcon, 1; Mourning Dove, 10; Road Runner, 1; Empidonax sp., 10; Loggerhead Shrike, 4; Yellow-rumped Warbler, 9; Townsend's Warbler, 1; Wilson's Warbler, 12; Scott's Oriole, 9; Black-headed Grosbeak, 19; Lazuli Bunting, 4; House Finch, 25; Lesser Goldfinch, 2. Remarks: Most of the breeding birds were concentrated in the portions of the plot where Joshua Trees occurred. Most species breeding in the area utilized the Joshua Trees as singing perches. This may account for the greater number of species breeding on this plot as opposed to the nearby desert scrub plot which lacked Joshua Trees.

Rock Wrens were restricted to areas that contained boulders or rock outcroppings.

The Shrikes, Cactus Wrens and Orioles had territories that were larger than the study area, and ranged well outside the plot.

Desert Scrub - Breeding Bird Survey

DESERT SCRUB. -- Location: California; Kern County, Sand Canyon, in southern most extension of the Sierra Nevadas, 12 miles north on highway 14 from intersection of state highways 178 and 14, then about 5 miles west on Brown Road; south branch of road crosses eastern half of plot. (on map, plot lies immediately west of the y formed by the intersection of the main stream bed and the intermittent stream from the South Fork); would be SE $\frac{1}{4}$ of Sec. 1, T 25 S, R 37 E, if defined on map, Little Lake Quadrangle, 1954 USGS.

Continuity: New. Size: 12.5 ha = 31.25 acres. Description of Area: Plot covered with shrubs .5 to 1.5 m in height. Density of shrubs decreases from east to west as slope increases. Dirt road cuts through plot from north to south near east boundary. Plot is bounded on north and east by ravines with permanent streams and good stands of willows. South and west boundaries are formed by rock outcroppings. Vegetation: See vegetation study. Topography: East facing slope, with severity of slope increasing from east to west. Plot very sandy, with rock outcroppings on south-western boundary. A steep-sided ravine cuts upper (western) half of plot. Weather: Temperatures ranged from 45° to 94° F. Light rain fell on April 30 and May 1. Heavy rain fell on May 8 and 9. Some precipitation occurred on several other days in May. Coverage: May 1, 4, 11,

14, 18, 21, 24, 27. Total, 8 trips between 0430 and 0900 (Pacific Standard Time). Total man-hours 16.

Count: (breeding birds) Costa's Hummingbird, 6 (48, 19); Rock Wren, 4 (32, 13); Brown Towhee, 4 (32, 13); Black-throated Sparrow, 22 (176, 70). Averaged Total: 36 birds (288/km², 115/100 acres). Visitors: Prairie Falcon, 1; California Quail, 2; Mourning Dove, 24; Road-runner, 2; White-throated Swift, 4; Western Kingbird, 3; Ash-throated Flycatcher, 1; Empidonax sp., 32; Olive-sided Flycatcher, 2; Scrub Jay, 3; Raven, 2; Bewick's Wren, 3; Blue-gray Gnatcatcher, 4; Nashville Warbler, 3; Townsend's Warbler, 7; MacGillivray's Warbler, 3; Wilson's Warbler, 49; Scott's Oriole, 2; Northern Oriole, 1; Western Tanager, 6; Black-headed Grosbeak, 8; Indigo Bunting, 1 (rare in California); Lazuli Bunting, 2; House Finch, 14; Lesser Goldfinch, 9; Brewer's Sparrow, 1. Remarks: Rock Wrens were restricted to the southwest corner of the plot, where rock outcroppings occurred. Surprisingly large numbers of migrating warblers and Empidonax Flycatchers utilized the area. While Black-throated Sparrow territories were distributed rather evenly over the western two-thirds of this plot, only one territory occurred east of the road. This was rather surprising since the area east of the road comprised 3.5 hectares and did not seem to differ in vegetational structure from the area to the west of the road.

Rabbitbrush Scrub - Breeding Bird Survey

RABBITBRUSH SCRUB. --Location: California; Inyo and Kern Counties, Sand Canyon, in southern most extension of the Sierra Nevadas, 12 miles north on highway 14 from intersection of state highways 178 and 14, then 3.5 miles west on Brown Road; from center of Sec. 7, T 25 S, R 38 E, the plot extends up the canyon following the main stream approximately 2.3 km, Little Lake Quadrangle 1954, USGS. Continuity: New. Size: 6 ha = 15 acres. Description of Area: Canyon bottom with constant stream. Area studied was immediately adjacent to willows where another plot was located. Fairly uniformly covered with Rabbitbrush and occasional sagebrush. Plot long and narrow (along stream) bounded on one side by willows and by desert scrub on the other.

Vegetation: See vegetation study of area. Topography: Association occurs in flat floodplain areas along stream. Rocky, steep slopes covered by desert shrub rather than Rabbitbrush. Plot extends from altitude of about 3200 to 3760 ft. (976 - 1146 m) over a distance of 2.3 km. Canyon runs from west to east starting in the Sierra Nevadas and opening onto the Mojave Desert.

Weather: Temperatures ranged from 45° to 94° F. Light rain fell on April 30 and May 1. Heavy rain fell on May 8 and 9. Some precipitation occurred on several other days in May. Coverage: April 16, 17, 23, May 12, 19, 20, 23, 26. Total, 8 trips between 0430 and

0830 (Pacific Standard Time). Total man-hours 32.

Count: (visitors) California Quail, 34; Mourning Dove, 99; Poor-will, 1; Costa's Hummingbird, 8; Ash-throated Flycatcher, 3; Empidonax sp., 10; Barn Swallow, 1; Scrub Jay, 3; Loggerhead Shrike, 1; Yellow-rumped Warbler, 4; Wilson's Warbler, 3; Western Tanager, 1; Black-headed Grosbeak, 1; House Finch, 6; Lesser Goldfinch, 1; Brown Towhee, 9; Black-throated Sparrow, 1; White-crowned Sparrow, 36. Remarks: California Quail were possibly breeding on the plot, all other species appeared to be using the plot purely for foraging or cover. The species composition of this study area is dominated by ground-foraging seed-eating birds. Seeds from Chrysothamnus and/or associated plants within this vegetation type may be a significant food source for wintering and migrating species.

Several species listed for this plot nest in the adjacent willows, and some individuals may have been counted for both plots.

Estimates for some species (ie: California Quail and White-crowned Sparrows) may be low due to their secretive habits or their tendency to flock.

Digger Pine Parkland - Breeding Bird Survey

DIGGER PINE PARKLAND. -- Location: California; Inyo County, Sand Canyon, in southern most extension of the Sierra Nevadas, 12 miles north on highway 14 from intersection of state highways 178 and 14, then about 6 miles west on Brown Road; northern boundary of plot is immediately adjacent to road, T 25 S, R 37 E, sections undefined, Little Lake Quadrangle, 1954 USGS. Continuity: New. Size: 9.05 ha = 22.63 acres. Description of Area: Relatively open park-like stand of Digger Pine with intermittent shrub understory. Bounded on the east by willows, on the north and south by desert scrub and on the west by a rather steep hill, sparsely covered with pine. Vegetation: See vegetation study of area. Topography: Plot lies near confluence of an intermittent and a permanent stream. Area is relatively flat, with the exception of the southeast corner, where the terrain is more rugged. A rock outcropping extends from the central portion of the south boundary to the center of the plot. Weather: Temperatures ranged from 45° to 94° F. Light rain fell on April 30 and May 1. Heavy rain fell on May 8 and 9. Some precipitation occurred on several other days in May. Coverage: April 30, May 3, 5, 8, 10, 13, 18 and 27. Total, 8 trips between 0430 and 0900 (Pacific Standard Time). Total man-hours: 16. Count: (breeding birds) Mourning Dove, 10 (110, 44; Long-eared Owl,

2 (22, 9); Costa's Hummingbird, 4 (44, 18); Hairy Woodpecker, 2 (22, 9); Scrub Jay, 6 (66, 27); Canyon Wren, 2 (22, 9); Blue-gray Gnatcatcher, 4 (44, 18); MacGillivray's Warbler, 2 (22, 9); Scott's Oriole, 2 (22, 9); Western Tanager, 2 (22, 9); House Finch, 6 (66, 27); Lesser Goldfinch, 6 (66, 27); Lawrence's Goldfinch, 2 (22, 9); Black-throated Sparrow, 4 (44, 18). Averaged Total: 54 birds ($594/\text{km}^2$, 242/100 acres). Visitors: Cooper's Hawk, 1; California Quail, 5; Mourning Dove, 73+; White-throated Swift, 1; Hairy Woodpecker, 1; Ladder-backed Woodpecker, 2; Western Kingbird, 2; Ash-throated Flycatcher, 5; Western Flycatcher, 5; Empidonax sp., 51; Western Wood Pewee, 2; Olive-sided Flycatcher, 5; Scrub Jay, 1; Raven, 2; Robin, 1; Hermit Thrush, 10; Western Bluebird, 1; Ruby-crowned Kinglet, 12; Hutton's Vireo, 5; Solitary Vireo, 7; Warbling Vireo, 8; Nashville Warbler, 1; Yellow-rumped Warbler, 11; Black-throated Gray Warbler, 4; Townsend's Warbler, 18; Hermit Warbler, 15; Wilson's Warbler, 10; Brewer's Blackbird, 1; Brown-headed Cowbird, 1; Black-headed Grosbeak, 9; House Finch, 7; Rufous-sided Towhee, 1; Brown Towhee, 2; Black-throated Sparrow, 1. Remarks: Nests of Lesser Goldfinch (2) and Blue-gray Gnatcatcher (1) were found on the plot. Two recently fledged Long-eared Owls were seen on May 18. The Canyon Wren was heard singing on the corner of the plot, but was never actually observed.

Hermit Thrushes possibly nested on the plot, but no conclusive evidence was found. Estimates of density for Mourning Doves and House Finches may be inaccurate due to the difficulty of telling breeding birds from those regularly passing through the plot.

Methods

Preliminary investigation of the Sand Canyon area indicated the presence of a number of discrete habitat types. Among the most important of these habitat types in terms of bird diversity were Riparian Willows, Desert Scrub, Joshua Tree Woodland, and Pine Parkland. Study plots were established in representative portions of each of these habitat types. In addition, a plot was established in disturbed areas adjacent to the willow plot. The size of each plot was determined by the area of homogeneous habitat available or (in the case of the willows plot) by the amount of habitat which could be effectively censused by one person in one day. Dimensions of the plot were determined by measurement with a meter tape. Permanent stakes were placed at the corner of each plot. Wooden stakes were erected at 50 meter intervals along transect lines criss-crossing the plot. Each stake was given a unique number and letter combination. The stakes thus served as points of reference within the plot. Maps were made of each plot, indicating each reference point. Eight separate censuses were taken on each plot, between 15 April and 28 May, 1977. The position of each bird observed on the plot was recorded on a census map. Singing males were specially designated, and the direction of birds flying over the plot was noted.

After all censuses had been completed, the positions of all birds recorded were compared between maps of the same plot. If a particular species was recorded singing multiple times in the same general location, it was considered to be a breeding resident. Other information of obvious importance, such as the presence of a nest or the observation of courtship or nest building behavior was considered in the analysis. Birds with territories that only partially lay on the plot were counted as breeding on the plot. Each territory was considered to support a breeding pair of birds (ie: 10 territories = 20 birds). Remaining recorded birds (those not counted as breeding individuals) were considered to be transients and are listed as visitors on the summary sheets.

